The Saskatchewan
Agricultural Research
Fund

Annual Report 1983-84

Saskatchewan Agriculture

The Saskatchewan Agricultural Research Fund

85-1388/

The Saskatchewan Agricultural Research Fund

To His Honour,
The Honourable Fredrick W. Johnson
Lieutenant Governor of the Province
of Saskatchewan

Sir:

I have the honour to submit the Fifth Annual Report of the Saskatchewan Agricultural Research Fund for the period April 1, 1983 to March 31, 1984.

I have the honour to be Sir,

Your obedient servant
Lorne H. Hepworth
Minister of Agriculture

The Saskatchewan Agricultural Research Fund

Honourable Lorne Hepworth
Minister of Agriculture

Dear Sir:

It is my pleasure to present the Fifth Annual Report of the Saskatchewan Agricultural Research Fund for the period April 1, 1983 to March 31, 1984.

Respectfully submitted

J.L. Drew
Deputy Minister of Agriculture

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Dear Sir:

I am pleased to present the Fifth Annual Report of the Saskatchewan Agricultural Research Fund for the period April 1, 1983 to March 31, 1984.

Respectfully submitted

S. Ann Barnsley
Chairman of the Saskatchewan
Agricultural Research Fund

Introduction

The Saskatchewan Agricultural Research Fund was established by the June 15, 1979 proclamation of The Agricultural Research Funding Act. The Fund consists of such money as may be appropriated annually by the Legislature, the annual earned interest, plus other money which may be transferred into the Fund by the Lieutenant Governor-in-Council. A portion of the funds are made available annually to individuals, corporations, co-operatives, associations or other organizations for the purpose of agricultural research in the Province. Applications are invited annually from interested parties. Initial appropriation for 1979-80 fiscal year was $3.25 million.

The Fund is administered by a producer-represented Board which has authority to make grants, loans or guarantees or enter into agreements or contracts respecting assistance provided to persons. The Board as appointed by the Lieutenant Governor-in-Council, consists of seven persons, including five practising agricultural producers and two agricultural research professionals. The Chairman and Vice-Chairman of the Board are designated by the Lieutenant Governor-in-Council. The Deputy Minister of the Saskatchewan Department of Agriculture serves as an advisor to the Board. The Board is responsible to the Minister of Agriculture.

Activities 1983-84

In 1983 eighteen applications for new projects were approved for a total of $272,200. Seven projects totalling $108,400 received approval for their second year of research. Six third year projects were awarded a total of $62,000. The fund received 109 applications requesting a total of approximately $2.4 million.

Abstracts of the 15 third-year projects, 9 second year projects and 16 first year projects are printed in this report. More detailed reports are available as a separate publication.

Audited financial statements of the Fund, as provided by the Provincial Auditor, are presented herein as the final section of this report.

The Board extends their appreciation to all who submitted applications in 1983 and hopes that this degree of interest will be maintained. They look forward to great benefits to agriculture from the research that will be forthcoming.

Saskatchewan Agricultural Research Fund Board 1983-84

CHAIRMAN:	**Mrs. Ann Barnsley** Box 625 BALCARRES, S0G 0C0
VICE-CHAIRMAN:	**Dr. J. Milton Bill** Department of Animal and Poultry Science University of Saskatchewan SASKATOON, S7N 0W0
MEMBER:	**Dr. Art Gultard** 3727 Balfour Street SASKATOON, S7H 3Z5
MEMBER:	**Mr. Roy Levee** Box 7 RADVILLE, S0C 2G0
MEMBER:	**Mr. Henry Martynse** Box 1208 WYNYARD, S0A 4T0
MEMBER:	**Mr. Clarence Schmidt** R.R. #2 Craven, S0G 0W0
MEMBER:	**Mr. Richard Weetman** STEWART VALLEY, S0N 2P0
ADVISOR:	**Mr. Jack Drew** Deputy Minister Saskatchewan Agriculture 3085 Albert Street REGINA, S4S 0B1
SECRETARY:	**Ms. Brenda Machin** Saskatchewan Agriculture 3085 Albert Street REGINA, S4S 0B1

Distribution of Projects and Funding by Program Area

Program Area	Awarded		% of Total Awarded		Assigned		% of Total Assigned	
	1982-83	1983-84	1982-83	1983-84	1982-83	1983-84	1982-83	1983-84
Cereal Crops	5	3	12.5	9.7	96,500	38,500	14.4	8.7
Special Crops	7	5	17.5	16.1	118,800	57,900	17.7	13.1
Forage Crops	3	2	7.5	6.4	45,100	45,300	6.7	10.2
Horticulture Crops	4	3	10.0	9.7	39,600	19,800	5.9	4.5
Ruminants	7	4	17.5	12.9	128,100	75,800	19.1	17.1
Non-Ruminants	6	7	15.0	22.6	125,000	110,300	18.6	24.9
Land, Air, Water	3	2	7.5	6.4	60,500	27,000	9.0	6.1
Energy, Equipment	0	1	—	3.2	—	11,000	—	2.5
Socio-Economics	3	2	7.5	6.5	31,900	37,000	4.7	8.4
Miscellaneous	2	2	5.0	6.5	26,500	20,000	3.9	4.5
	40	31			672,000	442,600		

Approved Projects 1983

Title	Research Manager	Institution	1983 Grant
Cereal Crops			
Influence of Nitrogen Fertilizer on the Agronomic Performance and Quality of "Stubbled-In" Winter Wheat (Triticum Aestivum L.)	Dr. D.B. Fowler	Crop Development Centre Univ. of Sask.	$15,000
Variability in Spring Wheat for Rapid Germination and Seedling Vigour at Low Temperatures	Dr. G.R. Hughes	Dept. of Crop Science & Plant Ecology Univ. of Sask.	10,000
Biology and Control of the Wheat Blossom Midge in Saskatchewan	Dr. J.F. Doane	Agriculture Canada Research Station Saskatoon	13,500
Special Crops			
Evaluation of Four Oilseed Sunflower Hybrids Under Three Fertilizer Regimes at Four Locations in Saskatchewan	R.E. Morgan/ D.S. Hutcheson	Product Development Farm Service Division Saskatchewan Wheat Pool	12,600
An Evaluation of Seeders for Sowing Pulse Crops	Dr. G.G. Rowland	Crop Development Centre Univ. of Sask.	6,500
Development of a Bleaching Resistant Dry Green Cotyledon Pea for Saskatchewan	Dr. A.E. Slinkard	Crop Development Centre Univ. of Sask.	10,000
Evaluation of Canola Products and By-Products	Dr. J.M. Bell	Dept. of Animal & Poultry Science Univ. of Sask.	20,000
Scentless Chamomile Control Program	Dr. G. Bowes	Agriculture Canada Research Station Regina	8,800
Forage Crops			
An Evaluation of Winter Hardiness in Saskatchewan Forage Grasses	Dr. A.E. Limin	Dept. of Crop Science & Plant Ecology Univ. of Sask.	15,300
Fertilizer Requirements of Grazed Seeded Grass Pastures and the Effects on Nutrition and Production of Beef Cattle and Subsequent Performance on Winter Feed	Dr. R.D.H. Cohen	Dept. of Animal & Poultry Science Univ. of Sask.	30,000
Horticultural Crops			
Fruit and Vegetable Varietal Trial	C.O. Green	Prairie Produce Ltd. Outlook	3,600
Using Etiolation as a Pre-treatment in the Propagation of Saskatoon Softwood Cuttings	Dr. S.H. Nelson	Dept. of Horticulture Science Univ. of Sask.	4,200
Inhibitory Effects of Green Foxtail (Sertaria Viridis L.) on Onion Plants	Dr. D.H. Dabbs	Dept. of Horticulture Science Univ. of Sask.	12,000

Ruminants			
Superovulation in the Cow: Effect of Day of Cycle and Gonadotropin Dose	Dr. R.J. Mapletoft	Western College of Veterinary Medicine Univ. of Sask.	17,000
Potassium and Electrolyte Balance in Rations for Dairy Cows and Calves	Dr. D.A. Christensen	Dept. of Animal & Poultry Science Univ. of Sask.	16,000
B-Carotene Nutrition and Reproduction in Beef Cows: Continued Studies	Dr. B. Laarveld/ Dr. J.G. Manns Dr. B.D. Murphy/ Dr. F.M. Bristol	Western College of Veterinary Medicine Univ. of Sask.	12,800
Intensification of Sheep Production Under Prairie Conditions	Dr. N.C. Rawlings	Western College of Veterinary Medicine Univ. of Sask.	30,000
Non-Ruminants			
Garter Snake Ecology — Behaviour of Aggregation	Dr. D.M. Secoy	Dept. of Biology Univ. of Regina	3,600
The Feasibility of Utilizing Saskatchewan Reared Honeybee Queens in Commercial Honey Production	T. Taylor / S. Clifford	Nipawin	16,000
Swine Barn Ventilation	Dr. E.M. Barber	Dept. of Agric. Engineering Univ. of Sask.	30,000
Evaluation of the Bioavailable Biotin from Saskatchewan Feed Ingredients for Pigs	Dr. R. Misir	Dept. of Animal & Poultry Science Univ. of Sask.	8,000
Oxalic Acid in Saskatchewan Feeds	Dr. N.F. Cymbaluk	Dept. of Animal & Poultry Science Univ. of Sask.	7,700
Dietary Enzyme Supplementation as a Method of Improving the Nutritional Value of Cereal Grains	Dr. H.L. Classen	Dept. of Animal & Poultry Science Univ. of Sask.	30,000
Quantification of the Increase in Feed Consumption Due to Social Facilitation	Dr. N.J. Lewis	Dept. of Animal & Poultry Science Univ. of Sask.	15,000
Land, Air & Water			
Groundwater Irrigation	Dr. J.A. Gillies	Dept. of Agric. Engineering Univ. of Sask.	12,000
Use of Leonardite in Soil Improvement	Dr. Z. Abouguendai	Saskatchewan Research Council Saskatoon	15,000
Energy and Equipment			
Development and Testing of an Improved Wild Rice Harvestor for Northern Saskatchewan	Dr. R. Kushwaha	Dept. of Agric. Engineering Univ. of Sask.	11,000

Socio-Economics			
Economics of Dryland Crop Rotations in Saskatchewan	Dr. R.P. Zentner	Agriculture Canada Research Station Swift Current	27,000
Analysis of Key Farm Business Management Decisions Required for Changover from Traditional Summerfallow Intensive Cropping Systems to New Water Efficient/ Energy Efficient/Low Tillage Crop Intensive Rotation System on Saskatchewan Farms	R.J. Bens	Biggar	10,000
Miscellaneous			
High Temperature Fermentation of Straw	Dr. D.E. Caldwell	Dept. of Applied Microbiology & Food Science Univ. of Sask.	$11,000
Production of a New Variety of Whey and Sugar Fermenting Bacteria Through Applied Genetics	Dr. G. Khachatourians	Dept. of Applied Microbiology & Food Science Univ. of Sask.	$ 9,000

Abstracts of Approved Projects 1982

Cereal Crops

The Evaluation of the Nitrogen Requirements for Cereal Grains Grown Under the Zero Till Farming System

D.A. Rennie $22,000
M.C.J. Grevers
Department of Soil Science
University of Saskatchewan

Two test sites were located at farm co-operators, one at Kindersley and one at Leipzig. Fields with at least five years under zero till were compared with adjacent fields that had been summerfallowed.

Soil water recharge over winter was monitored at both locations. At Leipzig the soil moisture levels increased by 8 cm and by 5 cm under zero- and conventional-till, respectively. Considerable loss of soil water was observed at Kindersley during the period after the snow had melted and spring seeding. Soil moisture levels were reduced by 4.5 cm and by 8 cm under zero till and conventional till, respectively.

Fertilizer placement of N and P fertilizers was evaluated as fall, winter and spring applied, and as broadcast, sideband, deep band and seedplaced. Yields between conventional till and zero till were comparable where soil N and H_2O were not limiting. Placement of fertilizer N proved to be far more critical under zero till than under conventional till. Spring deep banded or spring sidebanded N and P resulted in the highest yields. Spring broadcast N resulted in the lowest yields. Apparent fertilizer N recoveries were substantially higher under zero till than under conventional till. Deep banded and sidebanded both N and P resulted in apparent fertilizer N recoveries of 56-71% and 28-33% under zero till and conventional till, respectively. Water use efficiency was considerably higher under zero till when fertilizer N and P had been added. Disposition of fertilizer nitrogen using ^{15}N was evaluated at Kindersley. A total of 48 cylinders had been installed and are presently being analyzed.

Soil physical properties at both sites were measured. No consistent trend was found in soil strength that was directly attributable to zero till. Samples are currently being analyzed for bulk density and hydraulic conductivity. Soil temperature data was collected at the Leipzig site, data analysis is still in progress.

The Inheritance and Nature of Sprouting Resistance in Barley

B.L. Harvey $25,000
B.G. Rossnagel
R.P. Muderewich
Dept. of Crop Science & Plant Ecology
University of Saskatchewan

A source of dormancy WM143-2-3b, was generously made available to us by Dr. D.R. Metcalfe. We crossed WM143-2-3b with Norbert, Fairfield and S77433. Norbert is highly susceptible to sprouting, Fairfield has a small amount of dormancy and S77433 is hulless and non-dormant. We have also crossed Maris Concorde and **Hordeum spontaneum** to advanced breeding materials.

The following conclusions have been drawn from the observations we have made to date. The

dormancy factor(s) is located in the hulls. The inheritance of dormancy is quantitative and of medium heritability. We have selected segregants with adequate levels of sprouting resistance. It will be difficult, however, to select sprouting resistant types with good malting quality since there is a negative relationship between sprouting resistance and amylclytic enzyme activity. Breeders using the single seed descent method of breeding will have to use GA_3 treatment to avoid selecting against sprouting resistance.

The Role of Supercooling in Herbacious Plants in Preventing Frost Damage

L.V. Gusta — $20,000
Crop Development Centre
University of Saskatchewan

The frost tolerance of wheat, barley, oats, canola (rape) and mustards were determined in the seedling stage and when the crop started to head out and ripen. In the spring, wheat is the most frost tolerant crop tested followed by barley, oats, canola and mustards. Columbus and Neepawa wheat in the seedling stage can tolerate -7° to -8°C of frost with little or no apparent effects. Rape and mustards in the cotyledon stage are killed or injured at -4° C. As these crops develop into the 4 to 6 leaf stage they gain an additional degree or so of frost tolerance.

In the fall the most sensitive part of the plant is the developing head or flower. A frost of -4° to -5° C causes either death or reduced yield. A fall frost of -6° C at the time of grain fill reduces the subsequent germination of seeds in wheat, barley and oats. Oats are the most sensitive of the three species tested.

Influence of Nitrogen Fertilizer on the Agronomic Performance and Quality of "Stubbled-In" Winter Wheat (Triticum Aestivum L.)

D.B. Fowler — $15,000
Crop Development Centre
University of Saskatchewan

Nitrogen fertilizer trials were conducted on winter wheat fields of co-operators at Clair, Kindersley and Watrous. Uptake studies showed a decrease in percent N in stems and leaves of winter wheat plants as the growing season progressed. The percent N in the heads decreased as the heads matured at two sites and increased at a third site. Seed N was also highest at the third site. Increased rates of N gave increased yields in most instances. However, yield response curves fall off at lower N rates than for previous studies. Preseed N applications also gave unexpected high yields. Responses to 46-0-0 were much more erratic than for 34-0-0. A close relationship was established between available soil N and seed protein yield.

Variability in Spring Wheat for Rapid Germination and Seeding Vigour at Low Temperature

G.R. Hughes — $14,500
Dept. of Crop Science & Plant Ecology
University of Saskatchewan

Controlled environment studies revealed differences among the 30 diverse spring wheat cultivars tested for seed germination rate and for rate of seedling emergence at low temperatures. Two cultivars, one from the U.S.S.R. and one from Mexico, were up to two days earlier germinating and one day earlier emerging than present commercial cultivars. Of the commercial cultivars tested, Park germinated and emerged faster than Benito, Columbus, Neepawa and Sinton. These four cultivars were among the slowest of all the cultivars tested.

Field trials on summerfallow and on stubble confirmed these cultivar differences. The cultivars differed also in plant development rate and in seedling vigour as measured by vegetative production. During the stages of plant growth up to 4 weeks after seeding, plant development rate was closely related to rate of emergence, but this relationship became progressively smaller beyond that time. No relationship was found to exist between rate of emergence and maturity.

The results obtained to date suggest that the major benefit of rapid germination at low temperatures is to ensure a well-established plant stand. Rapid germination and emergence will not, per se, lead to earlier maturity, but rather a combination of rapid rates of germination, emergence and plant development will be necessary to achieve this objective. Cultivar differences exist for these traits, which are only partially dependent, and selection for more rapid rates should be successful. The success of such selection is to be investigated.

Special Crops

Improved Management Practices for Canaryseed Production in Saskatchewan

A.E. Slinkard — $12,000
B.N. Drew
Crop Development Centre
University of Saskatchewan

Results from on-farm trials indicate that the optimum seeding rate under a range of conditions is about 35 lb/a (39 kg/ha). Alden and Keet have now been licensed in Canada, but only certified seed of these two cultivars can be produced in Canada. Alden and Keet are comparable in seed yield. Canaryseed is less drought-tolerant than spring wheat due to its shallower root system. However, it does well on stubble, provided it is adequately fertilized and there are reasonable summer rains. If moisture is not too limiting, canaryseed responds to nitrogen and phosphate fertilizer even better than spring wheat.

Canaryseed seedlings start slowly and are poor weed competitors. Thus, herbicide use is often necessary. Several additional herbicides have been registered for use in canarysced recently, and the list now includes bromoxynil (TORCH, PARDNER), bromoxynil plus MCPA mixtures (BUCTRIL M, BROMOX 450, BROMINAL M, SABRE), difenzoquat (AVENGE 200C), flamprop methyl (MATAVEN) and dicamba (BANVEL LH).

Rapeseed Meal and Rapeseed By-Product Evaluation and Utilization

J.M. Bell — $30,000
Department of Animal & Poultry Science
University of Saskatchewan

Canola seed containing from 20 to 65% frost damage and similar levels of dockage were analyzed botanically and chemically. This seed was fed ground, whole and pelleted to pigs in digestibility trials in rations containing zero, 15 and 30% frost-damaged seed having three levels of frost damage: low, medium and high (20, 45, 65%). Ammoniation treatment was also examined. Similar rations were also fed to pigs from 23 to 100 kg weights to obtain data on growth rate and efficiency of feed utilization. Glucosinolate levels appreared to be reduced by frost damage. Ground seed was at least twice as digestible as whole seed. Pelleting was about as effective as grinding. Ammoniation improved digestibility slightly. Using digestible energy and protein values thus determined it was demonstrated that canola seed was worth 121 to 151% of the price of good quality feed barley, depending largely on the price of canola meal and in part on the extent of the frost damage in the seed. The feeding trials confirmed the digestibility data and indicated that frozen canola seed, ground or pelleted, and replacing barley and canola meal to maintain dietary protein level, allows normal performance.

Biology and Control of Ascochyta Blight of Lentils

R.A.A. Morrall $16,500
Department of Biology
University of Saskatchewan

Field evaluations of fungicides on lentil plants suggested that there is considerable potential for this type of chemical control of ascochyta blight. Single applications of one fungicide to a susceptible cultivar gave yield increases of 18 and 25% respectively at two locations and potential profits of about $60 per ha. Two or three applications of another compound at judicious intervals increased yields by about 50% and potential profits by about $160 per ha. These results need confirmation from a second year's work. A study of the effects on seed quality of swathing vs. desiccation plus straight combining gave inconclusive results, probably because of abnormally hot dry conditions at harvest. A 90-day feeding trial was done with rats to assess potential toxicologic risks of feeding ascochyta-infected lentils to livestock. No major differences in weight gain, organ function or blood chemistry were found among rats fed normal rat chow, rats fed predominantly normal lentils and rats fed predominantly lentils with severe ascochyta infestation. A comparative study of the morphological variability and host range of **Ascochyta** isolates from lentil and other legumes suggested that **A. lentis** is morphologically indistinguishable from **fabae** and may need to be reclassified as a **forma specialis** of **A. fabae**, specialized to infect lentils.

Factors Affecting Soil Persistance of Triazine Herbicides Used on Triazine Resistant Rapeseed

R.B. McKercher $16,600
R. Ashford
Department of Soil Science
University of Saskatchewan

Studies were conducted to determine the tolerance of a triazine-resistant rapeseed (**Brassica campestris** L. var. Candle) to the three triazine herbicides, atrazine, cyanazine and metribuzin. The action of these herbicides on stinkweed (**Thlaspi arvense** L.) was studied under field conditions.

Pot experiments showed Candle was most resistant to atrazine and least resistant to metribuzin. Cyanazine as a postemergent spray caused unacceptable phytotoxicity at a rate above 2.00 kg/ha. This effect was not observed if the same herbicide was preplant soil-incorporated. In the field, postemergent spray applications gave similar results. Field applications of atrazine at 1.00 kg/ha, cyanazine at 2.00 kg/ha, and metribuzin at 0.30 kg/ha, gave acceptable control of stinkweed.

Soils from the field trials were bioassayed using turnip (**Brassica rapa** L. var. Purple Top Milan). Residues of all herbicides were detected in soils sampled 22 weeks after herbicide application. Atrazine applications left the most residue. At 48 weeks after application, atrazine residues had decreased, and cyanazine and metribuzin residues had decreased or disappeared. Atrazine was the only herbicide to leave residues phytotoxic to oat (**Avena sativa** L. var. Harmon) grown as a field bioassay the following year.

The GR_{50} concentrations of atrazine, cyanazine and metribuzin were correlated with the organic matter content of five soils. One of the soils from Melfort, had a high organic matter content of 10 percent, and the GR_{50} values of the three herbicides in this soil largely influenced the regressions of soil organic matter against herbicide GR_{50} values. Soil organic matter contents of the other soils ranged from 3.5 percent to 4.9 percent and excluding the Melfort soil there was no relationship between soil organic matter content and herbicide GR_{50} values. Thus, organic matter content can't be used as the sole factor in determining the availability of atrazine, cyanazine and metribuzin in a soil.

Evaluation of Four Sunflower Hybrids at Three Fertilizer Regimes and Six Locations in Saskatchewan

R.G. Morgan $11,800
G.L. Hnatowich
Saskatchewan Wheat Pool
Regina

Five replicated plot experiments were established to evaluate the suitability of different sunflower hybrids to various areas in the province and to study sunflower response to different nutrient levels and growing conditions. Results were obtained only at two of the five locations.

Analysis of the Watrous adaptability study indicated that fertilizer nitrogen treatments had no significant effect on either yield, oil content, seed weight or head size. Days to flowering and physiological maturity were similar for all treatments, however, nitrogen applications (banded and broadcast) did result in significantly taller plants when compared to check treatments.

Varietal assessment indicated that the Morden varieties (M 20 and M 24) were the lowest yielding, however this was believed to be attributed to excessive bird damage. Of the five varieties tested, results indicated that M 20 and M 24 were significantly shorter in days to flowering and maturity but produced the highest seed weights and oil contents. The Morden varieties also proved to be significantly shorter than all other varieties as well as from each other, M 20 obtaining 10 cm more

growth than did M 24. Head size was fairly uniform for all varieties.

Results of the Carievale adaptability study were similar to those obtained at Watrous with respect to nitrogen application. No significant response occurred with nitrogen applications for any measured characteristic.

Comparisons between varieties indicated that agronomically M 20 performed as well and in some cases, such as earliness, better than the other hybrids.

A simple economic evaluation indicated that at either location the net return for sunflowers was greater then the returns obtained for either wheat or barley.

Evaluation of Crude Vegetable Oil for Utilization in Drilling Fluids

M. Picard — $13,500
C.S.P. Foods Ltd.
Saskatoon

Drilling mud formulations were developed using canola (rapeseed) oil as the continuous phase. Physical properties of drilling mud formulations, such as density and viscosity, were measured and compared to a common diesel oil based mud. One of the new formulations developed is an environmentally safe, non-toxic, biodegradable oil mud for use in off-shore and remote areas which have disposal problems. The oil mud formulations developed were super to water based muds in lubrication, shale inhibition, temperature stability and corrosion prevention. Other formulations, consisting of canola oil and mineral oil, were developed to overcome viscosity increases due to low temperature situations. Non-toxic additives such an emulsifiers, shale stabilizers, weighting agents and gel strength increases were also tested. Variations in the water/oil ratio resulted in viscosity changes which could be successfully altered.

Non-toxic biodegradable by-products from canola processing such as meal, clay and fines were also tested as possible circulation additives and filter loss agents. These materials produced satisfactory results in the tests performed.

The Development of Recommendations for Economic Seeding Rates of Faba Beans and Broadbeans and an Evaluation of Seeders for Sowing Pulse Crops

G.G. Rowland — $16,800
R. Graf
R. Kehrig
Crop Development Centre
University of Saskatchewan

Outlook faba bean and the Chinese Broad Bean were sown at six densities ranging from 13 to 75 plants/m² at both Saskatoon and Hagen in 1982 and 1983. Yield data suggests that 25 plants/m² or possibly 38 plants/m² for both types would give the best economic return. Plant density did not appear to have any effect on flower fertilization showing that pollinators are able to visit plants even in heavy stands.

Fifteen seed metering devices (seedcups) were tested on lentils, peas, faba beans, chickpeas and the Chinese Broad Bean in laboratory and field tests. It was found that seedcups having no modifications or adjustments usually performed well on only a limited range of seed size. The best performing seedcups could be modified to accommodate the various seed shapes and sizes.

Forage Crops

Breeding Leafcutter Bees Adapted to the Saskatchewan Environment

G.H. Rank — $6,200
Department of Biology
University of Saskatchewan

Evaluation of selections for reproductive superiority was undertaken. Replicated field plots were set up using 1500 bees per shelter. Each shelter was separated by 400 m. The movement of bees between shelters was monitored by the placement of paint on the upper thorax of females. The results from three years experiments can be summarized by stating that we were unable to detect any differences in reproductive capacity between different selections. The main problem seems to be drifting since we observed that up to 30% of females in any selection drifted 400 m or more. This mixing of selections makes it impossible to evaluate selections for reproductive performance under field conditions. Since we can not evaluate reproductive performance under laboratory conditions we can not evaluate our selections in any meaningful way.

Selections for one generation per year (univoltinism) have also been carried out in conjunction with Mr. and Mrs. Mumm at Shellbrook. The evaluation of this desirable agronomic trait is not dependent on field evaluation and should result in superior strains if selection is maintained over a 5 year period.

Fertilizer Requirements of Grazed Seeded Grass Pastures and the Effects on Nutrition and Production of Beef Cattle and Subsequent Performance on Winter Feed

R.D.H. Cohen — $25,000
S.B.M. Wright
Department of Animal & Poultry Science
University of Saskatchewan

Four levels of nitrogen fertilizer (0, 50, 100 and 200 kg N/ha) were applied to two replicates of a 32 year old brome (**Bromus inermis**)/crested wheatgrass (**Agropyron cristatum**) pasture. The pastures were grazed by 40 tester animals at 2.5 heifers/ha and additional 'put and take' animals to allow uniform utilization of pasture.

Soil samples were collected before fertilization and at the end of the grazing season. Every two weeks, heifers were weighed and pasture quality, availability and utilization determined.

The number of animal grazing days (AGD), total liveweight production (TLP) and total forage production (TFP) increased curvilinearly with increased fertilizer application. Maximum AGD (292 days) occurred at 200 kg N/ha, TLP (200 kg/ha) at 150 kg N/ha and TFP (5659 kg DM/ha) at 120 kg N/ha.

An Evaluation of Winter Hardiness in Saskatchewan Forage Grasses

A.E. Limin $13,900
D.B. Fowler
Department of Crop Science & Plant Ecology
University of Saskatchewan

The severe winters experienced in Saskatchewan can subject forage crop stands to a considerable degree of cold stress. To assess the potential for winter damage or the possible loss of first year seedling forage grass crops, an objective cold hardiness rating would be valuable. When this information is combined with a cold hardiness rating of established grass stands, the production and seeding time of particular forage species can be recommended for various regions of the province depending upon the expected winter severity for that area. When fall planted, reed canarygrass, meadow bromegrass, orchard grass, altai wild rye, Russian wild rye, creeping red fescue, smooth bromegrass, intermediate wheatgrass, tall wheatgrass, and northern wheatgrass were found to be similar or less hardy than "Norstar" winter wheat. This suggests that snow trapping would be necessary for the winter survival of these seedling species in many areas. Those species with greater cold hardiness than Norstar winter wheat included hard fescue, timothy, and crested wheatgrass. None of these seedling grasses were as cold hardy as "Puma" fall rye indicating that some snow cover is important to ensure healthy spring stands of fall seeded forage grasses.

The cold hardiness of established grass stands was on average greater than that of the seedlings. The least hardy species, meadow bromegrass, reed canarygrass, orchard grass and intermediate wheatgrass were similar in hardiness to Norstar. Most other species sampled from established stands achieved levels of hardiness similar to that of Puma rye, indicated a high degree of cold tolerance and therefore indicating that damage due to cold temperature should be minimal.

Horticultural Crops

Evaluation of Day Neutral Strawberries for Commercial Production in Saskatchewan

C. Stushnoff $15,000
J. Turner
Department of Horticulture Science
University of Saskatchewan

The new day-neutral strawberry cultivars, although developed for California conditions appear to have potential for commercial production for the late summer and fall market in Saskatchewan. The best cultivar in our study was 'Hecker', which we planted at 53,796 plants/hectare, produced 11,000 kg/ha. 'Fort Laramie' was next best and 'Aptos' and 'Brighton' were least effective. The traditional June-bearing cultivars were found to be unsuitable for an annual production scheme. Plastic mulches and poly tunnels were ineffective in enhancing production.

There are many questions yet left unanswered including; winter survival, market potential, fertility, pest control and above all a second years data to confirm these results.

This project was not funded for a second year thus this work will be terminated.

Utilization of Waste-Heat from a Potash Mine for Protected Cultivation

E.A. Maginnes $14,000
G.H. Green
Department of Horticulture Science
University of Saskatchewan

During the past year an experiment was conducted to introduce mine exhaust air directly into the plant-growth space through a system of perforated ducts instead of between the 2 layers of polyethylene covering the greenhouse. This approach resulted in the possibility of maintaining plant growth of selected crops for the 10 warmest months of the year using only mine exhaust. Further, a 77% energy saving is possible for lettuce using a combination of mine exhaust and gas fired unit heaters set to come on when the temperature drops to 10°C.

Both cucumbers and lettuce grew satisfactorily when exposed to fine dust in the mine exhaust. Thus, this is a feasible means of growing selected crops under Saskatchewan conditions.

Weed Control in Commercially Produced Onions

D.H. Dabbs $7,800
Department of Horticulture Science
University of Saskatchewan

These replicated and irrigated trials were again conducted on both a Bradwell clay loam at Saskatoon and an Asquith fine sandy loam at Outlook, Saskatchewan.

Once again a wide range of herbicide combinations were assessed. Some of these were registered herbicides, many had been tried before but required further testing, and a number were completely new. Of the extremely limited number of materials that are presently registered for use in onions that best combination once again was CIPC at 3.00 kg active ingredient per hectare applied early postplant, followed by Hoegrass at 1.00 kg active ingredient per hectare when grassy weeds were in the 1 to 4 leaf stage and, in turn, followed by Totril at 0.5 kg active ingredient per hectare when the onions had three leaves.

A tank-mix of Hoegrass and Totril in 600 litres of water per hectare was much more effective on large weeds than was the same rate of these two herbicides applied in the normal 400 litres of water.

CIPC tends to be somewhat phytotoxic to germinating onions under some soil and climatic conditions, and this situation has resulted in a search for a safer replacement Pendimethalin (Prowl) may become this replacement.

A number of other new herbicides also showed considerable promise, and once again showed that at least some research of this nature must be ongoing in order that the continuing stream of new herbicides can be carefully assessed.

Vegetable Varietal Trial

C.O. Green $2,800
Prairie Produce Ltd.
Outlook

In 1983 selections of broccoli, cantaloupe and watermelon were tested in single ten metre rows while varieties of cauliflower, red cabbage and winter cabbage were tested in a replicated plot trial. Two varieties of sweet corn were compared on a field scale basis.

Ruminants

Intensification of Sheep Production Under Prairie Conditions

N.C. Rawlings $30,000
I.A. Jeffcoate
W.E. Howell
Western College of Veterinary Medicine
University of Saskatchewan

This project has as its aim to increase ewe productivity by enhancing fertility and breeding ewes 3 times in 2 years. It is also an aim to spread the supply of lamb across the year by breeding ewes at spaced and predetermined times throughout the year. A scheme is being evaluated whereby a flock of ewes of breeds found on the Prairies is split in two. The 2 groups are bred 3 times in 2 years, spaced 4 months out of phase, using estrous synchronization, day length manipulations and a variety of other techniques. A thorough examination of the economics and managerial requirements for intensifed production to be successful are an integral part of the study. The project was initiated in August of 1982 and all groups of ewes have lambed twice so far. Fertility has been good but the need for rigid culling, excellent nutrition and selection of young healthy and prolific ewes has already become an obvious necessity.

The Evaluation of Effects of Sulfates and Other Elements in Drinking Water on Trace Mineral Requirements of Cattle

C.M. Williams $24,000
M.E. Smart
D.A. Christensen
R.D.H. Cohen
Department of Animal & Poultry Science
University of Saskatchewan

An experiment was designed to determine what effect sulphate removal from the drinking water had on the plasma and liver copper and zinc concentrations of beef cows and their calves. The water was purified by a process of reverse osmosis. Prior to purification the water contained 521 mg Sulphur/Litre, after purification, 54 mg Sulphur/Litre.

The dietary copper and zinc intake was 10 mg and 20 mg/kg respectively. The total sulphur concentration in the diet of cows drinking sulphated water was .34% and desulphated water .18%.

At calving, the plasma copper concentrations were significantly higher in the cows on the desulphated well water. This difference was maintained until the cattle were taken out of their treatment groups and turned out to pasture. The liver copper concentration was significantly higher in cows on the desulphated water just prior to going on pasture. The effects of water purification on calves' plasma and liver copper concentrations were not significant but the trend was for the concentrations to be higher for calves from cows on the desulphated water. Sulphate removal had no effect on plasma and liver zinc concentrations of the cows or their calves. Water purification had a positive effect on heifer body weight at calving and during the lactation period.

Embryo Transfer in the Cow: Effect of GnRH Estradiol on Superovulatory Response with FSH

R.J. Mapletoft $20,000
Western College of Veterinary Medicine
University of Saskatchewan

A study was designed to evaluate the superovulatory response and embryo quality of donor cows when either estradiol 17B or gonadotrophin releasing hormone (GnRH) was used in a follicle stimulating hormone (FSH) superovulatory regime. Fifty-four cycling crossbred females were superovulated in replicates on day 10 ± 2 of their cycle. Group I received 28 mg FSH over four days and prostaglandin (PGF) on the morning of day 3. Group II received FSH and 400 ug of estradiol 17B 36 hours after PGF and group III received FSH and 250 ug GnRH i.m. 48 hours after PGF. Inseminations were done at 12, 24 and 36 hours after the onset of estrus. Ova/embryos were collected non-surgically at day 7 postestrus. Numbers of corpora lutea (CL) were recorded and recovered ova and embryos evaluated.

Although the superovulation was deemed to be satisfactory in all cows, there were no differences among treatments. The mean total ova/embryo number in group III was significantly higher than in groups I and II ($P < .05$) however, no significant difference existed in the mean numbers of fertilized and transferrable embryos. No significant differences existed between groups for recovery rate, fertilization rate or percentage of transferrable embryos. A significant correlation existed between CL numbers and each of the ova/embryo parameters and the estradiol levels at estrus.

B-Carotene Nutrition and Reproduction in Beef Cattle

B. Laarveld $18,000
L.G. Greenberg
B.D. Murphy
F.M. Bristol
J.G. Manns
Department of Animal & Poultry Science
University of Saskatchewan

Beef heifers and cows were placed on two rations: low and high B-carotene. The ration consisted of a mixture of barley, canola meal, vitamin and mineral pre-mix with straw ad libitum. Vitamin A injections were given monthly. The treatments started on November 1, 1982 and lasted until August 1, 1983. The carotene supplemented animals were classified as having good carotene status; the controls had almost non-detectable levels of carotene in blood. Carotene treatment did not appear to have any major effect on fertility. Days to first detected estrus, conception rates and plasma progesterone levels were similar for both treatments. These results suggest that B-carotene by itself does not play an important role in fertility.

Potassium and Sodium Bicarbonates as Buffers for High Concentrate Dairy Rations

D.A. Christensen $16,400
Department of Animal & Poultry Science
University of Saskatchewan

A dairy production trial was conducted to compare sodium bicarbonate, potassium bicarbonate, their effects on milk yield and composition and on acid

base balance in high producing cows. These two rations were compared to a control barley based concentrate and a ration containing ammonium chloride designed to induce a mild acidosis. Half of the ration consisted of concentrate and the other half of dry matter derived from barley silage. The feeding program was similar to that used in the University of Saskatchewan dairy herd. The inclusion of sodium or potassium bicarbonates did not improve total feed intake. However, there was a tendency for both buffers and especially for potassium bicarbonate to increase milk fat percentage and total solids contents of the milk. Urinary and blood pH measurements indicated that the ammonium chloride produced a marked acidosis and that the control ration without the buffers added was much less acidotic. Therefore, there was only a small potential for the buffers to demonstrate their effect. There was, however, evidence that potassium bicarbonate is as effective as sodium bicarbonate as a buffer in dairy rations. It is recommended that potassium bicarbonate be further evaluated and that the studies be extended to the newly weaned calf which like the lactating dairy cow is subject to a dietary acidosis.

The Evaluation of Selenium and Copper Status in Domestic Animals Using Copper or Selenium-Dependent Enzyme Assays

B.R. Blakley — $9,900
H.G.G. Townsend
Western College of Veterinary Medicine
University of Saskatchewan

The suitability of ceruloplasmin, a copper metalloenzyme, and glutathione peroxidase, a selenium metalloenzyme, to evaluate the copper and selenium status in livestock was investigated. Ceruloplasmin activity in cattle and sheep correlated very closely with the corresponding blood copper concentrations. The mathematical relationship between copper and ceruloplasmin remains linear throughout the entire spectrum of values. This indicates that ceruloplasmin levels are a useful measurement of copper levels in cattle and sheep with a copper status ranging from the deficient to the high normal range.

Glutathione peroxidase activity appears to indicate the selenium status in deficient animals only. Cattle or sheep with a marginal or normal selenium status cannot be distinguished. The relationship between blood selenium levels and glutathione peroxidase activity does not remain linear throughout the entire spectrum of values. Since glutathione peroxidase activity is only useful to identify selenium-deficient animals, its diagnostic suitability may be somewhat limited. In all species tested, glutathione peroxidase retains its activity for about 3 weeks when stored at -4°C or 4°C. The activity declines rapidly if the blood is stored at room temperature. The enzyme activity increases 200-400% as the assay temperature is raised from 18°C to 45°C in the various animals species tested.

An Evaluation of the Effects on Livestock Accidently Ingesting Low Levels of Pesticides and Herbicides

R.K. Chaplin — $9,800
Western College of Veterinary Medicine
University of Saskatchewan

The effect agricultural chemicals have on the rumen fermentation system compared to the whole animal has been evaluated. Rumen fluid taken from a fistulated sheep was combined individually with four organophosphate, two organochlorine and one carbamate insecticides, one fungicide and four herbicides. Fermentation activity was evaluated by quantitating gas production and protozoal activity. Using varying amounts of each chemical the minimum toxic dose or amount of chemical required to reduce rumen activity at least 10% was determined. Compared to the minimum toxic dose required to poison the entire animal the rumen varied in its sensitivity depending on the chemical tested. The greatest discrepancy involved pentachlorophenol (Pentox) in which the rumen was 150 times more sensitive than was the published toxic dose for the animal. Other chemicals tested in which the rumen appears to be more sensitive are Trichlorfon (4.3x), Lindane (1.9x), Methoxychlor (16.7x) and Parquat (3.4x). Remaining chemicals like Malathion, Dimetholate, and Carbofuran which are used as grasshopper insecticides are more toxic to the animal. The same was found for Ronnel, 2,4-D, Roundup and Picloram. Future studies are looking at rumen recovery following ingestion of the more toxic chemicals.

Non-Ruminants

Home Range and Migration in Pest Garter Snake, Thamnophis radix haydeni

D.M. Secoy — $5,000
P. Lawson
Department of Biology
University of Regina

The proposed research concerns three aspects of the pheromone trailing behaviour of the western plain's garter snake, **Thamnophis radix haydeni**, and consists of three separate studies.

The first aspect which was to be considered deals with mating behaviour. It has been suggested that males will preferentially court larger females over smaller females (Hawley and Aleksiuk, 1975, 1976) due to differences in the amount of pheromones produced by the females (Crews and Garstka, 1982). In addition to pheromonal cues, visual cues have also been suggested as a means of guiding males to females (Noble, 1937). The objective of experiment I is to examine the role of pheromonal and visual cues in the size preferences in mate selection reportedly demonstrated by males.

Experiment II concerns the influence of conspecifics on behavior during the following of food trails. This experiment has been completed and a report on this research is available.

A final study included in the proposal is an examination of trailing behavior during fall migration, when the garter snakes begin forming aggregations during the return to the hibernaculum (Aleksiuk and Stewart, 1971). Little experimental work has been done regarding this aspect of the trailing behavior in garter snakes. The objective of experiment III is to examine this aspect of the behavior of **Thamnophis radix**.

The research has begun in the spring of 1983. Several problems were encountered, including

difficulties in collecting snakes due to lowered population levels as a result of a dry season and a high mortality of snakes kept in artificial hibernation. Thus experiments I and III were not carried out at that time as was originally planned. These two studies will be undertaken this summer and completed by the fall of 1984. The second experiment is especially important for the examination of aggregation in this species.

The Economics of Wheat and Grain/Protein Ratios in Growing/Finishing Hog Rations

R. Blair
B. Rakshit
K.A. Rosassen
V.J. Racz
Prairie Swine Centre
University of Saskatchewan

$25,000

A total of 240 animals (144 castrates and 96 gilts) are being employed, over the weight range 20 to 100 kg. They are grouped 6 or 12 to a pen on a sex-separated basis and are fed one of 3 Grower diets (based on wheat or barley, or barley plus fat), followed by one of 2 Finisher diets (based on wheat or barley). The aim is to find out which energy level in the Grower diet is most economical in terms of growth performance, and to determine the best combination of Grower/Finisher diets for optimal carcass quality. This project is still in progress and the final batch of animals has been placed on test. The project is due for completion by Fall 1984.

The Influence of Nutritional Density on the Productivity of Chicken Broilers

H.L. Classen
G.L. Campbell
R.K. McMillan
R.E. Salmon
Department of Animal & Poultry Science
University of Saskatchewan

$30,000

Two research trials involving 3,840 chicken broilers were utilized to further study dietary nutritional density. In experiment 1, the use of meat meal was examined in diets containing variable levels of corn, wheat, barley, soybean meal and tallow. Performance of the broilers was equal regardless of meat meal addition and the effect of nutrient density on growth rate and feed conversion closely approximated expectations based on previous data. In the second experiment a major objective was to establish the influence of nutrient density on carcass grading when birds were marketed at approximately the same weight. Grading for fleshing and fat content was not influenced by dietary nutrient density but the incidence of breast skin trimming was very high in the lowest nutrient density treatment. Also in the second trial, a commercial feed manufacturer formulated diets of varying nutrient density (3 nutrient density treatments) using their nutrient specifications. The two highest nutrient density treatments resulted in production which was similar to expected but the lowest nutrient density treatment results were considerably superior to expectations.

Traction of Sows on Farrowing Crate Floors

G.I. Christenson
Department of Animal & Poultry Science
University of Saskatchewan

$26,000

Crushing by the sow is a major cause of preweaning death of piglets. The sureness of a sow's foothold while standing and lying may influence this economically important loss, but it is not known how traction can best be determined. Two methods were evaluated: standing and lying frequency, and foot movement during the act of standing.

Standing and lying frequency was determined on four floor types by time-lapse photography. Sows stood less frequently and lay for longer periods on the day after farrowing than on the first day in the crate or 7 days post partum but there were no behavioral differences due to floor type.

Foot movement while rising was determined by visual observation. Day of observation had no effect and there was only a slight influence of crate type. Floor type markedly affected total foot movement, foot slippage and the number of movements taken while rising. Floors of plastic-coated expanded metal provided the surest foothold.

It is concluded that the most effective way to evaluate traction of sows is to observe the animals' feet closely while they are in the act of standing. These foothold data can now be correlated to health and performance data for sows and piglets.

A Feeding Regime for Early Weaned Piglets Based on the Natural Behaviour of the Piglet

N.J. Lewis
Department of Animal & Poultry Science
University of Saskatchewan

$23,000

Weaned piglets are commonly moved from an environment in which their milk consumption is highly regulated to an environment in which a less digestable, dry diet is fed **ad libitum**. A nursing piglet must suckle rapidly to acquire as much milk as possible during the 20-30 sec milk ejection. This experience appears to influence the weanlings feeding habits, causing over consumption of the starter, digestive upset, scouring and weight loss. This cycle could be prevented by controlling the piglets feed consumption for the first post weaning week. However, to do this, it would be necessary to determine the correct feeding schedule. An opperant conditioning apparatus was designed for this purpose. In this apparatus the piglet was required to work, panel press, for its feed and consequently did not overeat.

The piglets were found to consume 9 meals/day, 6 during the 12 hour day and 3 at night. The average meal size was determined to be 23.2 g, 26.9 g, 29.5 g, 35.1 g, 39.9 g, 41.3 g and 42.9 g for days 1 to 7 post weaning respectively. Using this information a theoretical feeding schedule was developed, which will be tested to determine if controlled feeding will reduce scouring and increase weight gains during the first week following weaning.

The Feasibility of Utilizing Saskatchewan Reared Honeybee Queens in Commercial Honey Production

T. Taylor
S. Clifford
Nipawin

$16,000

This, the second year of intended three year project was spent addressing the two major problems incurred in continuous overwintering of honeybee colonies; the loss of colonies through unsuccessful natural queen superceedures and overwintering hardships and the need to maintain colony numbers as a direct result of these losses. This need is now serviced by importing package bees from the

United States each spring. Two techniques of queen replacement were tested; queen-brood transfers and the cell technique. Inclement weather in the fall prevented the final inspections of the colonies to determine the success rate of either method.

The cell technique employed in the previous season yielded 14% new queens upon final inspections conducted this spring.

Single body (9 frame) nucs were produced this season by removing some bees and brood from strong colonies and not by dividing the entire colony. These nucs have been overwintered outdoors in a multiple pack. The costs of producing these nucs is much less than the cost of replacement bees and queens from the United States.

Land, Air, Water

Groundwater Irrigation

J.A. Gillies $12,500
Department of Agricultural Engineering
University of Saskatchewan

Detailed hydrolgeological and soils studies of proposed groundwater irrigation project areas, the cost of which must be borne by the proponent, are required before a permit will be issued authorizing project development. A right to use groundwater will only be issued if the studies provide conclusive evidence that pumping groundwater for irrigation will not significantly affect the long-term supplies for other users.

In Saskatchewan, the only aquifers capable of sustaining irrigation pumping rates, without adversely affecting the long-term supplies of other users, are the buried preglacial/glacial valley systems. However, the quality of water from such aquifers is generally not suitable for irrigation, unless the soils to be irrigated are light and the surface profiles are deep. In addition, groundwater withdrawals for irrigation differs from other groundwater users in that pumping occurs at very high rates and is seasonal.

Two co-operating irrigators are participating in this study by permitting their sites to be monitored on a long-term basis. One site is located southwest of Donavon, Saskatchewan and consists of a center pivot system on a quarter section being supplied at a rate of 44 1/s from the Tyner Valley Aquifer. This site had been irrigated for one year prior to the start of the study. The second site is located southeast of Watrous, Saskatchewan and consists of a center pivot system on a quarter section being supplied at a rate of 47 1/s from the Hatfield Valley Aquifer. This site had been irrigated for two years prior to the start of the project.

Surveys have been conducted at each site to locate soil sampling and water quality monitoring stations, observation wells and other significant topographical features. All available geotechnical data for each site has been obtained. Shelters for water level recorders have been installed on an observation well at each site.

Flow meters have been installed on the center pivot supply lines.

Data collection at each site consists of:
- recording the duration of system operation
- monitoring changes in the piezometric surface
- conducting an annual aquifer evaluation test
- measuring precipitation (natural, irrigation)
- monitoring the quality of the irrigation water
- sampling soils
- sampling water from domestic wells constructed in the vicinity of the projects

To date results indicate that soluble salts are accumulating within the root zone of the irrigated area, that irrigation pumping has not resulted in a significant reduction in piezometric head and that the quality of domestic water supplies developed in surficial aquifers in the vicinity of the irrigation projects is not being affected.

Micronutrient Status and Transformations in Saskatchewan Soils

R.E. Karamanos $30,000
J.J. Germida
Department of Soil Science
University of Saskatchewan

Micronutrient fertilization does increase yields on deficient soils in Saskatchewan. Copper is deficient in light textured and organic soils in the Gray soil zone. Low levels of available zinc are found on calcareous, high pH and eroded soils. Manganese is required for most organic soils that are cultivated. Boron is likely deficient in leached Gray soils. Molybdenum and iron are not problem nutrients for production of field crops in Saskatchewan.

The significance of yield response depends on the magnitude of the yield response, the cost of fertilizer application, and the residual value of the fertilizer. Yield responses in field trials have varied from 10-50% of the control.

Studies on the Efficient Utilization of Liquid Hog Manure

L.A. McLean $18,000
H.M. Austenson
J.L. Henry
Department of Crop Science & Plant Ecology
University of Saskatchewan

Liquid swine manure was applied to stubble barley annually for 3 years. If the manure was broadcast it made little difference in barley yield whether it was disced in or left on the surface. Injection increased barley yields by 9% to 16% over broadcasting.

Applications of 2000 gallons per acre increased barley yields by 12 bushels per acre (46%), 4000 gallons by 18 bushels per acre (71%) and 8000 gallons by 23 bushels per acre (90%) over unfertilized yields during the 3 year period.

The greatest increase in barley production was obtained when manure was applied at 2000 gallons per acre. At this rate a sow producing liquid manure at 3000 gallons per year would fertilize 1.5 acres. The value of the increased barley at $2 per bushel would average $36 per sow. From the standpoint of fertilizer costs saved the value would average $37.50 per sow.

Socio-Economics

Economic Analysis of International Durum Wheat Market

S. Kulshreshtha $10,500
Department of Agricultural Economics
University of Saskatchewan

Saskatchewan producers have increased their stake in the expanding international durum wheat market by virtue of their expansion in durum wheat production. This growth, however, has been coupled with instability both in price and trade levels. Since instability leads to uncertainty in making proper decisions, use of forecasting was deemed as one approach to minimize the detrimental effects of uncertainty in producers' decisions. This study was designed to develop forecasting models for the international durum wheat market using several methods of forecasting. The methods examined were (i) econometric model, (ii) Box-Jenkins method, (iii) futures method, and (iv) combined method.

Based upon a comparison of forecasting ability of the various models the combined method of forecasting produced superior results. Since in this method information from more than one forecasting method is used, the results are an improvement over the original forecasts.

The study also suggests that supply decisions of Canadian (mostly Saskatchewan) producers are price inelastic, but are heavily influenced by factors such as farm marketings and level of durum stocks in prairie elevators and at other inland positions. Similarly, the international durum wheat price, which was represented by the cash Minneapolis price, was affected by factors such as the U.S. embargo on exports to the U.S.S.R., level of durum wheat stocks in North America and the total of domestic and foreign demand for Canadian and U.S. durum. The international price of durum wheat was also found to be strongly related to the Chicago futures wheat prices but this method turned out to be a less satisfactory method of forecasting price, compared to other methods. The U.S. embargo on sales to U.S.S.R. helped the Canadian export prices to move in the upward direction as well.

An International Analyses of the Canadian and International Flaxseed Markets

G.G. Storey $9,600
Department of Agricultural Economics
University of Saskatchewan

Flaxseed has been an important commodity in the agricultural economy of Western Canada since the early settlement period. Trading in flaxseed futures were introduced in 1904 the same year as wheat. Producers have regarded flaxseed as a cash crop, one which they could produce and expect to sell in years when sales of wheat and other board grains are lower.

A great deal of uncertainty prevails about the future of flaxseed production and marketing in Western Canada. Although it contributed an average $41.4 million to farm cash receipts in Saskatchewan during the 1971-80 period, its share is relatively small in comparison to wheat, barley, and canola. Flaxseed is subject to price instability and as a consequence acreage is variable. In 1971, 925 thousand acres were planted in Saskatchewan; in 1976 only 200 thousand were planted. In 1971 farm price was $86/tonne rising to $374/tonne in 1975.

A large portion of Canadian produced flaxseed is exported. There is very little crushing of flaxseed in Canada. The economy, therefore, obtains little economic benefits resulting from the value added through processing. It is exported primarily to Europe and Japan where it is crushed, producing linseed oil and meal. This oil has found its primary use in the paint, varnish and lacquer industry. However, with the switch to synthetic paints and with the substitution of soybean oil for linseed oil, the future of linseed oil is uncertain.

The future of flaxseed as a crop in Saskatchewan may be strengthened through gaining an improved understanding of the structure and behavior of the international linseed oil and meal economy and markets. From this understanding development of new uses for linseed oil, meal and fibre, new varieties to increase yields and uses, as well as policies to encourage processing could be effected which could potentially improve the importance of this crop to the Saskatchewan economy. The instability problem of price, and at times, of marketability, which lead to uncertainty for producers in making rational production and marketing decisions can also be overcome through improved forecasting.

An Analysis of Cashflow Patterns for a Representative Sample of Saskatchewan Family Farms

W.G. Gamble $11,800
FarmWest Management Ltd.
Saskatoon

Deteriorating economic conditions in agriculture place increasing importance on cash flow planning. A key area which is often under-scrutinized in planning are the family expenditures. This project was an introductory work to outline inter-generational differences on farms in attitudes expectations and actual family cash expenditures.

Two years data for each of 6 farms were used to construct 3 case studies representing a young, an established and mature farm. The actual financial data was supplemented by a 23 page questionnaire.

The case studies illustrate key differences in family living expenses ($15,000 to $30,000) and significant differences in attitude, both between generations and between husbands and wives. The case studies re-emphasize the considerable difficulties faced by young farmers attempting to establish themselves.

Miscellaneous

Production of New Variety of Whey and Sugar Fermenting Bacteria Through Applied Genetics

G.G. Khachatourians $11,500
T.L. Haffie
Department of Applied Microbiology
& Food Science
University of Saskatchewan

The bacterium **Z. mobilis** can yield 7-12% ethanol only for glucose, sucrose and fructose. In order to broaden the fermentative substrate range and alcohol tolerance, studies into strain improvement approaches are being explored.

Our strategies include studies on bacterial conjugation, isolation and characterization of indigenous plasmids DNAs, study means of overcoming the genetic exchange barrier by 'zymocin' and **in vivo** or **in vitro** genetic manipulation and construction of an improved **Z. mobilis**.

During the past year, the thrust of the project has been the biological characterization of plasmid DNA for construction of potential vectors. Several phenotypes have been identified and associated with plasmids. We have also identified the nature of the interspecific mating and genetic exchange barrier that we first observed in 1982-3. We have termed this molecule(s) zymocin and are conducting research on means of defining its genetic location and elimination. Success in the latter goal could also be useful for making alcohol through co-fermentation process using two diverse micro-organisms.

Functional Properties of Potential New Binders in Processed Meats

A.R. McCurdy $15,000
Department of Applied Microbiology and
Food Science
University of Saskatchewan

Several cereal products were examined for functional properties and for acceptability as binders in a processed meat system. Fine barley export, fine barley domestic and pre-gelled wheat clears were shown to be good emulsifying agents. Wheat flours tended to be better fat binders than barley flours, however, the barley flours had a better water binding capacity than the wheat flours. The pre-gellatized wheat flours showed exceptional water binding at room temperature but were comparable to the barley flours at 70°C. The pre-gelled clears caused processing problems and the ammoniated mustard flour was unacceptable to a sensory panel.

The data collected from objective and subjective (sensory) analysis of the bolognas containing the binders will be useful to cereal processors as a marketing tool and to meat processors as information required for new formula development. In general, the barley flours appear to be better potential binders than the wheat flours. The pre-gelled wheat clears and regular wheat clears appears to have little potential as binders in processed meats.

Saskatchewan Agricultural Research Fund

Financial Statements

For the year ended March 31, 1984
Office of the Provincial Auditor
Regina, Saskatchewan

Auditor's Report

To the Members of the Legislative Assembly
Province of Saskatchewan

I have examined the balance sheet of the Saskatchewan Agricultural Research Fund as at March 31, 1984, and the statement of revenue, expenditure and fund balance for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1984, and the results of its operations for the year then ended in accordance with the stated basis of accounting, described in Note 1, applied on a basis consistent with that of the preceding year.

W.G. Lutz, F.C.A.,
Provincial Auditor.

Regina, Saskatchewan.
August 9, 1984.

Statement 1

Saskatchewan Agricultural Research Fund
Balance Sheet
March 31, 1984

(with comparative figures at March 31, 1983)

	1984	1983
Assets:		
Cash in bank	$ 908	$ —
Investments - at cost (Schedule 1)	3,743,457	3,998,405
Accrued interest receivable	96,125	57,086
	$3,840,490	$4,055,491
Liabilities and Fund Balance		
Liabilities:		
Bank indebtedness	$ —	$ 836
Grants committed	582,162	772,139
Accounts payable	2,112	—
	584,274	772,975
Surplus:		
Capital funds (Note 3)	3,256,216	3,282,516
	$3,840,490	$4,055,491

(See accompanying notes to the financial statements.)

Statement 2

Saskatchewan Agricultural Research Fund
Statement of Revenue, Expenditure and Fund Balance
For the Year Ended March 31, 1984

	1984	1983
Revenue:		
Investment interest	$ 420,202	$ 538,248
Total revenue	420,202	538,248
Expenditure:		
Grants committed during the year (Note 4)	438,712	672,000
Board expenses	4,382	2,951
Printing costs	3,408	3,214
Total expenditure	446,502	678,165
Excess of expenditure over revenue	(26,300)	(139,917)
Fund balance, beginning of year	3,282,516	3,422,433
Fund balance, end of year	$3,256,216	$3,282,516

(See accompanying notes to the financial statements.)

Saskatchewan Agricultural Research Fund
Notes to Financial Statements
March 31, 1984

1. Accounting Policies

a) Grant Commitment

Grant commitments are recorded as an expenditure of the Fund at the point in time the Saskatchewan Agricultural Research Fund Board approves the grant. Grants committed but not paid at the year end are reflected as a liability on the balance sheet.

b) Costs Borne by Other Agencies

In accordance with established government practice, the Saskatchewan Agricultural Research Fund has not been charged with any occupancy costs and no provision for such costs is reflected in these financial statements. These costs together with certain general administrative and employee benefit costs are absorbed by various departmental appropriations.

2. Incorporation

The Saskatchewan Agricultural Research Fund was incorporated under The Agricultural Research Funding Act, Chapter A-14.1, 1978 Revised Statutes of Saskatchewan. This Act came into force by proclamation of the Lieutenant Governor on June 15, 1979. The Saskatchewan Agricultural Research Fund is a capital fund from which grants are made to individuals, corporations, co-operatives, partnerships, associations or other organizations for the purpose of agricultural research in the province.

3. Capital Funds

This Fund was initially financed by an appropriation of $3.25 million in the year ended March 31, 1980. The intention of the Saskatchewan Agricultural Research Fund Board from the date of inception until February 2, 1984, was that only the investment income of the $3.25 million would be made available for expenditures. Effective February 2, 1984, the Saskatchewan Agricultural Research Board passed a motion "that a maximum of $20,000 from the capital fund be used for grants for the 1984-85 fiscal year." Therefore, at the comparative fiscal year-ends the capital funds would consist of:

	1984	1983
Funds available for grants	$ 26,216	$ 32,516
Invested capital funds, not available for grants	3,230,000	3,250,000
	$3,256,216	$3,282,516

4. Grants Committed

Grants committed during the year have been reduced by $3,888 representing prior year projects that have been terminated.

Schedule 1

Saskatchewan Agricultural Research Fund
Summary of Investments
As at March 31, 1984

Description	Rate	Maturity Date	Amount
Union Gas Promissory Note	9.80	April 2, 1984	$ 4,929
Province of British Columbia Treasury Bill	9.75	April 5, 1984	453,965
First City Trust Guaranteed Investment Certificate	9.90	April 17, 1984	15,000
Province of Alberta Promissory Note	9.82	May 3, 1984	4,851
Government of Canada Treasury Bill	9.43	May 4, 1984	4,788
Government of Canada Treasury Bill	9.86	June 1, 1984	4,888
F.W. Woolworth Co. Ltd. Promissory Note	10.40	June 5, 1984	9,766
Traders Group Promissory Note	10.50	June 12, 1984	926,025
Province of Quebec Treasury Bill	10.41	June 14, 1984	9,747
Roymor Mortgage Corporation Promissory Note	10.15	August 1, 1984	215,358
Roymor Mortgage Corporation Promissory Note	9.95	August 1, 1984	33,363
Government of Canada Treasury Bill	9.95	August 10, 1984	33,346
Government of Canada Treasury Bill	10.03	August 17, 1984	4,769
Government of Canada Treasury Bill	10.43	February 22, 1985	22,662
Canada Permanent Trust Guranteed Investment Certificate	15.00	April 14, 1985	500,000
Canadian Imperial Bank of Commerce Certificate of Deposit	12.00	June 17, 1985	500,000
First National Bank of Chicago Certificate of Deposit	11.625	April 1, 1986	1,000,000
Total Investments			$3,743,457